

**United States Government Accountability Office**  
**Washington, DC 20548**

December 21, 2006

The Honorable C. W. Bill Young  
Chairman  
The Honorable John P. Murtha  
Ranking Minority Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

Subject: *Defense Contracting—Questions for the Record*

On September 7, 2006, I testified before the Subcommittee on recent trends in Department of Defense (DOD) contracting. Specifically, I testified about practices that undermine DOD's ability to establish sound business arrangements, particularly those involving the selection and oversight of DOD's contractors and their performance. The need for prudence with taxpayer funds and long-range fiscal challenges demand that DOD ensure that its funds are spent wisely, and that it is buying the right things, the right way.

The Subcommittee requested that I respond to a number of post-hearing questions relating to various issues, including measures that DOD can employ to ensure better contracting outcomes. The specific questions and my responses are attached in appendix I. The responses are based on previously issued GAO products on DOD acquisitions, all of which were conducted in accordance with generally accepted government auditing standards. Because the responses are based on prior work, we did not obtain comments from DOD.

We will make copies of this letter available to others upon request, and it will be available at no charge on the GAO Web site at <http://www.gao.gov>. If you have any questions about this letter or need additional information please contact Katherine V. Schinasi at (202) 512-4841 or [schinasaki@gao.gov](mailto:schinasaki@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this letter. Key contributors to this letter were Carol Dawn Petersen, Chris Kunitz, and Bill Woods.

Sincerely,



David M. Walker  
Comptroller General  
of the United States

Attachment

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## **Appendix I: GAO Responses to Questions for the Record**

### **Award and Incentive Fees**

#### **1. Could you address how these award and incentive fees work, in practical terms?**

When we talk about fees, we are really talking about a government expense and a form of profit for contractors. Depending on how a contract is structured, award and incentive fees can account for all or a portion of a contractor's potential fee or profit. Unlike other contracts, award- and incentive-fee contracts allow an agency to adjust the amount of fee paid to contractors based on the contractors' performance. In practical terms, an award-fee contract sets up a system where the government periodically assesses the contractor's performance in areas such as quality, timeliness, technical ingenuity, and cost-effective management. These criteria are generally subjective and can include inputs as well as outcomes. Incentive fees, however, are more objective and outcome-based. The contract identifies specific cost or delivery targets, and/or performance goals, and the amount of fee earned by the contractor is to be directly related to achievement of these goals.

#### **2. Do you believe they are an effective way to create incentives with contractors? In other words, do they improve contractor performance?**

Award and incentive fees can be an effective tool if properly designed and effectively administered. However, for these fees to be effective, DOD must address the underlying problems in its acquisition system and more directly link the fees to the outcomes it wants. Because the weapon system programs that result from this system are in many cases unexecutable and/or subject to changing "requirements" or funding levels, DOD has been unwilling to hold its programs or its contractors accountable for achieving the very acquisition outcomes it has identified. As a result, fees are paid even when outcomes do not meet expectations. Addressing these broader acquisition issues and strengthening the link between fees and acquisition outcomes can increase the accountability of DOD programs for fees paid, of contractors for results achieved, and the likelihood that these fees will motivate the contractors and be an effective tool for the government.

#### **3. Do you believe we should discontinue the use of award and incentive fees?**

No, we do not believe they should be discontinued. Award and incentive fees can be useful if they are used in the appropriate setting. Each contract type has a use based on the level of risk involved. The problem occurs when you proceed into programs without realistic requirements and sufficiently mature technologies on which to base realistic cost and schedule estimates and attempt to offset that increased risk by offering award fees to motivate the contractor to overcome that risk. The important question is: Have you adequately defined and established appropriate criteria that enable you to measure outcomes? And finally, how do you apply those criteria in determining the level of fee that can be justified? We have made several recommendations to this effect, and DOD has responded favorably with new guidance to link award fees to acquisition outcomes. However, as with other recommendations we have made related to DOD weapon system acquisitions, the key will be how this new policy is implemented.

## **Acquisition Policy**

### **1. Given that DOD's acquisition policy seems to embrace practices endorsed by the Defense Acquisition Performance Assessment, the Defense Science Board Summer Study 2005, and GAO, what is preventing the services from consistently executing these policies?**

The services are not consistently executing these policies because DOD is not enforcing a knowledge-based approach, discipline is lacking, and business cases do not measure up. This is occurring, in part, because there are no consequences for actions that run counter to the intent of DOD acquisition policies—officials responsible for approving program starts are no longer in their positions by the time the consequences of their actions become evident. The department routinely accepts high levels of technology risk at the start of major acquisition programs. Mature technologies are pivotal to developing new products. Without mature technologies at the outset, a program will almost certainly incur cost and schedule problems. However, DOD's acquisition community moves forward on programs with technologies before they are mature and takes on responsibility for technology development and product development concurrently. Our work has also shown that DOD allows programs to begin without establishing a sound business case that matches requirements with technology, acquisition strategy, time, and funding. And once these programs begin, their requirements and funding change over time. In fact, program managers consider shifting requirements—which can result in added program complexity and costs—and funding instabilities—which occur throughout the program—to be their biggest obstacles to success. Fundamentally, DOD will need to reexamine the entirety of its acquisition process and how it is affected by requirements and funding processes. This includes making significant changes to program requirements setting, funding, and execution.

### **2. What else is needed to ensure that cost, schedule, and performance outcomes for new weapons are predictable and achievable when these programs seek approval from Congress?**

DOD needs to take additional steps to achieve outcomes on par with best practices. These include

- developing and implementing an acquisition investment strategy;
- ensuring that individual programs are executable; and
- clearly delineating responsibilities and holding government employees and contractors accountable for achieving desired results.

While DOD has incorporated into policy a framework that supports a knowledge-based acquisition process similar to that used by leading organizations, it must establish stronger controls to ensure that decisions on individual programs are informed by demonstrated knowledge. Moreover, Congressional approval of programs that have not taken these steps encourages DOD's subsequent requests for additional funding.

**3. What are the services doing now to ensure that the technologies in these programs are achieving the desired level of maturity before they proceed into system development?**

DOD is now required by law to certify to the Congress that technology is demonstrated to a specific maturity level before being approved for system development. However, this is a recent statutory requirement and it is too early to tell whether this requirement will ensure achievement of the desired technology maturity level before programs are authorized to proceed into system development. Prior to this new law, some of the criteria upon which this certification is based were reflected in DOD policy. However, our prior work showed that DOD written policies are not always observed in practice.

**4. GAO believes a sound business case is needed before a weapon system begins system development and demonstration yet finds many of the existing weapons' business cases to be broken. What do you consider key elements of a business case for starting a development program and how do you ensure these are followed in each planned development program?**

The following are the essential elements of a sound business case:

- A requirement exists that warrants a solution consistent with national security priorities.
- The developer has the mature technologies and technical knowledge necessary to meet the requirement.
- The developer has a knowledge-based product development plan that will attain high levels of design and production maturity at the right times.
- Reasonable estimates have been developed to execute the product development and production plan.
- Current and future funding will be available to fully resource the product development and production plan.
- The agency has the capacity, either in-house or by contractual arrangement, to manage its programs, including ensuring that contractors are subject to appropriate independent oversight as to cost, schedule, and quality.

To ensure that these elements are in place at the individual program level, DOD needs to (1) begin programs in the context of an overall funding-constrained, weapon system portfolio, and (2) say "no" when individual programs do not measure up. DOD will need the support of the Congress to succeed.

## **Management of Technological Risk**

### **1. It has often been demonstrated that concurrent technology development and production in programs lead to wasted funds and undelivered capability. Do you share in this concern? Please elaborate.**

I do share in this concern. It is essential that technology be developed separately—and before—the development phase of a product or weapon system. This is a best practice that results in predictable program outcomes. Our work shows programs that proceed with mature technology average about 5 percent cost growth; programs with immature technology experience about 35 percent cost growth. Moreover, immature technology delays design and production maturity.

### **2. Your most recent annual report on DOD weapon systems has many cases in which programs are entering production before TRL Level 7 has been reached. Can you offer some examples of programs with unnecessary concurrency?**

As we noted in that report ([GAO-06-391](#)), allowing technology development to spill over into product development puts an extra burden on decision makers and provides a weak foundation for making product development estimates. We found that programs that began with immature technologies have experienced average research and development cost growth of 34.9 percent; programs that began with mature technologies have only experienced cost growth of 4.8 percent. Examples of programs with concurrency include the F-22A, the Joint Strike Fighter, the Future Combat Systems, the VH-71 Presidential Helicopter, the Global Hawk, the CVN-21, the DDG-1000, the Multi-mission Maritime Aircraft, and the National Polar-orbiting Operational Environmental Satellite System, among others.

### **3. What prevents service acquisition executives from demanding that acquisition programs not go forward until technology is mature?**

First, the budgeting process requires that funding for a program is put on the table 2 to 3 years in advance—this creates pressure to proceed with the program despite how mature the technology is. Second, the requirements process tends to settle on ultimate performance, which puts pressure on programs to reach for exotic technology. Third, it is easier to say “yes” than “no”. There can always be a compelling case made that a particular program is an exception; the problem is that there are way too many exceptions. And finally, this is occurring, in part, because there are no consequences for actions that run counter to the intent of DOD acquisition policies—officials responsible for approving programs are no longer in their positions by the time the consequences of their actions become evident.

### **4. Should concurrent technology development and system production be an exception rather than the rule?**

Definitely. Sequential phasing of technology development and system development is DOD policy, best practice, and essential to delivering capability faster to the warfighter and more economically to the taxpayer.

## **5. What concrete proposals should be put in place to ensure programs are not allowed to proceed to production without demonstrated maturity in technology?**

DOD needs to make sure each new program is executable before the development begins, and well before production is considered. For example,

- Science and technology organizations need the resources, authority, and tools to mature technology and transition it to acquisition programs.
- Requirements must be clearly defined and achievable given available resources, including beginning product development with mature technologies. Once begun, requirements should not change without assessing their potential to disrupt the program and without being fully resourced.
- DOD should say no to programs that do not measure up, including canceling programs when appropriate.
- If a decision is made to proceed with immature technologies, the cost and schedule estimates should be increased commensurate with the additional risk.

In addition, the Congress can help by not funding programs that do not measure up.

### **Role of Contractors**

#### **1. Would you agree that DOD is relying more heavily on contractors to manage and deliver weapon systems?**

It is clear that DOD continues to increase its reliance on contractors to provide both products and services. DOD's obligations on service contracts rose from \$82.3 billion in fiscal year 1996 to \$141.2 billion in fiscal year 2005. Based on our work looking at various major systems, we have observed how DOD is relying on contractors in new ways to manage and deliver weapon systems. For example, the Army's Future Combat Systems is using a lead system integrator approach in which the prime contractor has greater than usual responsibilities in areas such as requirements definition, system design, and selection of major subsystem contractors. This could increase taxpayer risk, especially if the government does not provide adequate oversight.

#### **2. What factors are contributing to this increased dependence on contractors?**

A variety of factors have contributed to the increased dependence on contractors. In the case of the Future Combat Systems program, for example, the Army chose to use a lead systems integrator because it did not believe it had the in-house resources or flexibility to field such a complex system in the time required. More generally, spending on service contracting has increased in part to compensate for a declining civilian workforce. Increased security requirements since September 11 have also led to more contract spending, particularly in areas such as guard services.

### **3. What risks does it pose to protecting the government's interests?**

As reliance on contractors has increased, so has the need to ensure that the government's interests are protected. Organizational conflicts of interest present one type of risk to the government and these must be identified and managed, which requires careful government oversight. When the government is acquiring services, challenges arise when attempting to define requirements, establish measurable and performance-based outcomes, and assess contractor performance.

### **4. Do you think this increased dependence has been a conscious, managed trend, or has it more or less happened to us?**

In the area of service acquisitions in particular, which currently exceeds the value of major weapon systems, the growth in spending has not been a managed outcome. For example, when DOD reduced the size of its civilian workforce in the 1990s, it did so without proactively shaping the workforce to ensure that it had the specific skills and competencies needed to accomplish its mission. DOD has acknowledged that it faces significant workforce challenges that, if not effectively addressed, could impair the responsiveness and quality of acquisition outcomes. In a recent report, *DEFENSE ACQUISITIONS: Tailored Approach Needed to Improve Service Acquisition Outcomes, GAO-07-20*, Nov. 2006, we recommended a number of steps DOD should take to make service acquisitions a managed outcome.

### **5. What steps do we need to take to protect the government's interests (that is, on behalf of both the warfighter and the taxpayer) in an environment of increasing dependence on contractors?**

We are currently reviewing a number of aspects of this issue, including conflict of interest laws and ethical conduct standards for contractor employees. In addition, the Congress can play an important role through its oversight function in making sure that taxpayer interests are protected. On November 17, 2006, we offered a set of issues, based on GAO's work, for consideration for the agenda of the 110th Congress (*Suggested Areas for Oversight for the 110th Congress, GAO-07-235R*). The first set suggested targets for near-term oversight, including the need to address governmentwide acquisition and contracting issues. In this regard, we noted that the work of the government is increasingly being performed by contractors and many agencies rely on contractors to carry out their basic missions. At the same time, GAO's list of government high-risk areas includes acquisition and contract management issues that collectively expose hundreds of billions of taxpayer dollars to potential waste and misuse. Consequently, we suggested that Congress continue to monitor agencies' efforts to address existing problems, while facilitating a re-examination of the rules and regulations that govern the government-contractor relationship in an increasingly blended workforce. Actions and topics that need continued congressional oversight include:

- requiring agencies to report on mechanisms in place to ensure that contractors are playing appropriate roles and that agencies have retained sufficient workforce capacity to monitor contractor cost, quality, and performance, particularly in such critical operations as responding to Hurricane Katrina and rebuilding Iraq;

- assessing agencies' efforts to ensure that acquisitions are performance- and outcome-based, with appropriate risk-sharing contracts in place.
- requiring agencies with significant acquisition budgets, such as DOD, to better align requirements, budget, and acquisition processes to reconcile the differences between wants, needs, affordability, and sustainability, given current and future demands and resources; and
- monitoring the implementation of agency action plans to address the GAO high-risk areas related to acquisition and contract management.

### **Incremental Funding**

#### **1. Is it a good idea to expand the use of incremental funding for major weapon system programs? If not, why not?**

GAO has advocated full funding for capital asset acquisitions as a way to increase recognition of implied commitments embodied in budgetary decisions as compared to the incremental funding approach. That said, I am not aware of any plans by DOD to expand the use of incremental funding for major weapon system programs. Nevertheless, in testimony earlier this year before the Airland Subcommittee of the Senate Armed Services Committee, I expressed concern about an Air Force plan to use incremental funding for a multiyear contract for the F-22A program (*TACTICAL AIRCRAFT: Questions Concerning the F-22A's Business Case*, [GAO-06-991T](#), July 25, 2006). Subsequent to that hearing, the Congress authorized multiyear procurement for the F-22A, but expressly prohibited the use of incremental funding for the contract.

#### **2. Is it more dangerous to expand the use of incremental funding when the overall budget is projected to fall or become more competitive? If so, why?**

Inherent in the concept of incremental funding of a program or project is the expectation that additional funds will be available in subsequent years to bring the program or project to completion. Declining budgets or increased competition for available resources in subsequent years would certainly make it more difficult for that expectation to be realized.

### **NAVY: DD(X) Destroyer**

#### **1. What factors have contributed to driving DD(X) costs up and quantities down?**

DD(X) (now DDG 1000) lead ship procurement costs have increased to \$3.3 billion because the Navy underestimated the resources that would be required to construct (as well as design) a multi-mission ship offering significant new capabilities related to air defense, land attack, and undersea warfare. In addition, the Navy did not complete a comprehensive, program life cycle cost estimate until March 2005. Prior to this estimate, the Navy relied on program and contractor estimates and the life cycle cost estimate completed in 1997 for the former DD 21 program.

**2. Is this symptomatic of DOD's requirements, budgeting, and acquisition processes in general?**

Yes. Our work has shown that DOD programs often cost more and take longer to develop than estimated when program managers are forced to make cost and schedule predictions based on unproven technologies. Alternatively, initiating product development with a high level of knowledge about program technologies can help mitigate such risks.

As knowledge has grown in the DD(X) program, the Navy has frequently discovered that its desired capabilities did not align with the funding it had available. To compensate, the Navy has steadily reduced planned ship quantities and land attack capabilities to enable continued funding of other technology demonstration efforts on the ship.

We have also pointed out that the Navy generally does not hold a milestone B, which approves entry into the System Development and Demonstration phase, for ship programs until it is authorizing ship construction. Other DOD programs are required to complete milestone B before entering System Development and Demonstration. Completion of an independent cost estimate is tied to the milestone. As a result the Navy invested billions in DD(X) research and development without an in-depth analysis of cost. This practice of delaying the milestone continues today on such programs as Littoral Combat Ship and amphibious assault ship (LHA 6).

**3. What are the key risks that could jeopardize delivering the DD(X) on time and within cost?**

The Navy's strategy to continue maturing DD(X) technologies while refining the ship's design and beginning construction of lead ships places the program at significant risk for additional cost growth and schedule delays.

Key development risks include remaining work associated with maturing technologies, especially the volume search radar; completing design of the integrated deckhouse; and maintaining software release schedules.

Because the Navy plans to begin construction of the lead DD(X) ships with an incomplete understanding of the ship's critical technologies, design changes may occur that could require costly rework throughout the construction phase for the lead ships.

**4. What steps need to be taken on DD(X) to ensure that it is delivered on time and within cost?**

The Navy's cost estimate for DD(X) assessed a 45 percent probability of the lead ship delivering at or below a cost of \$3.3 billion. Consequently, the Navy may be forced to revisit planned capabilities for the ship in the event that its \$3.3 billion cost target becomes unattainable. Moreover, before construction begins in fiscal year 2008, the Navy should ensure that all technologies, such as the volume search radar, have been fully demonstrated.

## **NAVY/MARINE CORPS: Expeditionary Fighting Vehicle (EFV)**

### **1. What went wrong on the EFV program after it had such a good start?**

Program difficulties occurred in part because not enough time was allowed to demonstrate maturity of the EFV design during the System Development and Demonstration (SDD) phase. Best practices and current DOD acquisition policy call for system integration work to be conducted before critical design review is held. This review represents the commitment to building full-scale SDD prototypes that are representative of the production vehicle. In the case of the EFV, however, the SDD critical design review was held before the system integration work had been completed. While testing of early prototypes began one year before the SDD critical design review, it continued for three more years after the decision to begin building the SDD prototypes. Test schedules for demonstrating design maturity proved optimistic and success-oriented, and were extended, and major problems were discovered in testing of the prototypes. Specifically, the original schedule did not allow adequate time for testing, evaluating the results, fixing the problems, and retesting to make certain that problems are fixed before moving forward. The SDD schedule of about three years proved too short to conduct all necessary planning and to incorporate the results into design changes, resulting in schedule delays and cost increases.

### **2. Could these problems have been avoided?**

Yes. The program was positioned for a good start in that it had mature technologies fairly early. Subsequent problems could have been avoided if the program's System Development and Demonstration phase followed DOD policy preferences and best practices as they related to design and production maturity.

### **3. Was DOD policy in error, or was the program not following policy?**

DOD policy was not in error. In fact, the EFV was following a knowledge-based approach and other best practices, which had been incorporated into DOD's guidelines in 2000 for major acquisition and expanded into its May 2003 policy. In addition to having reached a relatively high level of technology maturity before starting SDD, the EFV program had earlier adopted best practices in its implementation of Integrated Product Teams and had trained its program office staff on this acquisition improvement initiative. As noted above, the EFV departed from the tenets of DOD acquisition policy and best practices shortly after SDD began, when it attempted to do system integration and system demonstration concurrently.

### **4. How do strategies that go against sound policy get approved?**

Our work on multiple weapon systems shows that most programs proceed with strategies that do not comport with the knowledge-based approach embodied in DOD written policies. For example, in our March 2006 assessment of weapon systems, only 10 percent of the weapon systems reviewed had begun SDD with mature technologies. There are several reasons for this. First, although DOD acquisition policy allows individual programs to tailor their own acquisition approaches, it does not include sufficient controls to ensure that key aspects of the policy are implemented. Second, programs proceed with optimistic

assumptions about what they can accomplish for their estimated cost and schedules. Third, as weapon system programs proceed through development, the desire to protect the program against disruption intensifies.

**5. What lesson from the EFV experience can be drawn and applied to DOD acquisitions in general?**

Using the lens of a knowledge-based business case, the EFV at the start of SDD was sound on requirements and technology maturity (knowledge point 1). While design stability was judged to be attained at the critical design review (knowledge point 2) immediately after entering SDD, it appears that holding critical design review so soon was premature. This particular acquisition strategy did not provide the resources (time and money) necessary to demonstrate design maturity and production maturity (knowledge point 3). A key lesson learned is that while it is necessary to demonstrate one knowledge point before a subsequent one can be demonstrated, this alone is not sufficient. Attaining one knowledge point does not guarantee the attainment of the next one. Rather, the acquisition strategy for any program must adequately provide for the attainment of each knowledge point even in programs, such as the EFV, which were in a favorable position at the start of SDD. If the acquisition strategy does not adequately provide for the attainment of all knowledge points, the estimates for cost and schedule will not have a sound basis.

**NAVY: Cost Growth in Shipbuilding Programs**

**1. What did the GAO's work reveal as the major causes of continued overruns in the Navy's shipbuilding program?**

Our February 2005 report ([GAO-05-183](#)) on cost growth in shipbuilding programs cited unrealistic estimates of costs as a key source of cost growth. Unrealistic estimates in turn led to unrealistic budgets and contract prices. Increases in labor hours and material costs were common, with low technology maturity at program start and immature design before beginning production contributing to these. We also identified deficiencies in cost reporting as a problem.

**2. The Navy has pledged over the past year or so to address this problem. Have you seen any concrete proposals, and if so, what do you think of them?**

The Navy has cited several actions it has taken to improve cost performance. These include using risk analysis in developing cost estimates, budgeting at the Office of the Secretary of Defense Cost Analysis Improvement Group estimate, using realistic inflation rates in developing cost estimates, withholding fees if the contractor does not provide useable and timely cost reports, and introducing more aggressive contract incentives.

We believe these are positive steps but it remains to be seen whether the Navy will follow through with these efforts. For example, while the Navy has said that it will use contract incentives in the form of more demanding share lines, lower ceiling prices, and lower

minimum fees (for cost plus incentive fee contracts), a key issue is whether these policies will be sustained over time.

We also believe that further actions are needed. To reduce the risk of cost growth, the Navy needs to insure that technology risk is not carried forward into construction. Technology risk, and with it the potential for design changes, needs to be addressed before construction begins. This has not been the case with the DD(X) program, where key technologies—such as the dual band radar—have not been fully demonstrated.

Moreover, we believe the Navy could better ensure realism of budgets and contracts. We believe funding and contracting for a detailed design of the ship should be separated from the funding and contracting for construction. A budget request for ship construction would be informed by the knowledge gained from the first year or two of detail design.

### **3. Should ship programs be put on firm fixed price contracts?**

Use of fixed price contracts is dependent on how much uncertainty exists. It is important to reduce uncertainty early in a program so that technology and design risks are not carried forward into construction. Following a knowledge-based approach will likely enable follow-on ships to use fixed price contracts. Use of such contracts would provide the strongest incentive for improving cost performance—under a fixed price contract the cost risk of performance generally shifts to the contractor.

### **4. What specific ideas would you offer to deal with this problem?**

In addition to the suggestions discussed above, we believe the Navy should increase its use of cost-performance trade studies—including design-to-cost and cost as an independent variable (CAIV) techniques—to identify cost reduction opportunities in its new ship designs and position the Navy to achieve “best value” outcomes in its shipbuilding programs. Establishing design-to-cost goals early in a program encourages consideration of cost as a key design parameter when evaluating other parameters such as schedule, performance, and operational capability. Goals can be set in each phase of the shipbuilding acquisition process and tracked until desired cost targets have been achieved. In addition, iterative CAIV analyses can aid Navy efforts to properly balance cost with performance, design, and system requirements in its shipbuilding programs. Such analyses can help the Navy quantify and evaluate the degree to which its planned investments will result in increased utility to the warfighter and subsequently position the Navy to tailor future ship capabilities in ways that maximize value.

## **ARMY: Future Combat Systems (FCS)**

### **1. Was the Army’s decision to begin System Development and Demonstration phase with over 75 percent of FCS critical technology elements immature consistent with DOD policy?**

The decision to enter the System Development and Demonstration phase with 75 percent of

technologies immature does not satisfy the basic tenets of DOD policy and best practices. DOD policy and best practices are very clear that technologies should be mature before system development begins. FCS, in particular, is worrisome because it is now three years past the beginning of development, and most of the technologies remain immature by best practice standards.

**2. In retrospect, what should have been done to bring the program in line with DOD policy and best practices?**

The program should not have entered System Development and Demonstration with undefined requirements and immature technologies. Rather, it should have remained in the science and technology community until the enabling technologies were mature, or requirements should have been traded down to match the available technologies.

**3. What are the implications for other acquisition programs—will they adhere to DOD policies for awarding System Development and Demonstration contracts for only those weapons whose critical technologies have achieved desired maturity levels?**

Programs like FCS underscore the challenge in getting better program outcomes. Despite being out of alignment with the knowledge-based approach outlined in DOD policy and advocated by best practices, the program was approved to begin the System Development and Demonstration phase and funded at high levels. The example of success then becomes not programs that follow the intent of the policy, but those that do not and still win approval and funding.

**4. What can be done to mitigate risks in FCS, given where it is today?**

We have recommended that the Secretary of Defense limit DOD's commitment to the FCS product development phase and eventual production until a sound business case that is consistent with DOD acquisition policy and best practices can be clearly demonstrated. Further, we have recommended a go/no-go decision be made in 2008 after the preliminary design is done. This would in essence be the time that the program is ready for a system development decision, as technologies should have reached a basic level of maturity and system level requirements should be finalized by this time. In addition, the Army's fiscal outlook is extremely challenging. Outside of the Army, competition for production dollars will be great as both the Air Force and Navy have significant production programs planned for that time. Outside DOD, there will be an increasing squeeze on discretionary funds (weapons are discretionary) from other federal sectors.

**5. What does the reliance on a lead systems integrator (LSI) say about the Army's ability to manage a program of this magnitude?**

The Army's reliance on a LSI suggests that the FCS is so ambitious in scope, complexity and schedule, that it exceeded the Army's own ability to effectively manage such a complex program.

## **6. What risks does the use of an LSI pose for protecting the interests of the government?**

The use of an LSI can pose a risk with respect to organizational conflicts of interest. For example, an LSI might favor its own solutions over other competing solutions. Further, if the LSI stands to benefit from the continuation of a program into production, it has a financial stake in the outcome that could compromise judgment. Over time, the government's ability to oversee and act independently from the LSI could weaken as experienced government managers retire and dependence on the LSI increases.

### **ARMY: Warfighter Information Network-Tactical (WIN-T)**

#### **1. Was WIN-T another program that was approved with unrealistic expectations for requirements, technology, cost, and schedule? Did the program's original strategy follow DOD policy and best practices?**

At the time DOD approved the start of system development in August 2003, only three of WIN-T's 12 critical technologies were close to full maturity. Although DOD policy calls for technology maturity by the start of system development, DOD did not require that the other nine critical technologies reach a level close to full maturity until the start of low-rate production.<sup>1</sup> The technical and program risks of moving forward with immature technologies are exacerbated by the significant interrelationships among WIN-T's critical technologies. For example, mobile communications technologies—a critical component of WIN-T's operational concept—rely on antennas and other technologies to achieve their performance objectives, and a lag in the development of any of these technologies would result in a lag in the overall development of mobile communications.

With respect to requirements, DOD had approved an operational requirements document for WIN-T shortly before the start of system development. However, WIN-T's interdependencies with other programs further heighten the technical challenges and risks associated with the program. In particular, at the time WIN-T system development began, the Army's networking requirements for FCS—which WIN-T is expected to heavily support—were not well understood. As a result, the networking needs of FCS and the capabilities WIN-T planned to deliver to this program were not well synchronized. In addition, WIN-T's tightly compressed schedule assumed nearly flawless execution and did not allow sufficient time for correcting problems if they arose.

#### **2. What steps did the Army have to take to buy JNN? Why was this approach necessary?**

Rather than undergoing the normal acquisition processes, the Army resorted to extraordinary measures outside of the normal requirements, acquisition, and budgeting processes—including the supplemental budget process—to rapidly acquire and field the Joint Network Node-Network (JNN-N). Specifically, instead of initiating a formal acquisition program, the

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<sup>1</sup>In mid-2003, the Army developed risk mitigation plans for the nine immature technologies, but a program review sponsored by the Army in July 2004 concluded that these plans lacked sufficient detail.

Army utilized existing contracts, originally established for modifying legacy networking systems, to procure JNN-N equipment in approximately 5 months. For example, a purchase agreement from the WIN-T program was used to procure satellite trailers; a General Services Administration contract was used to arrange training; and existing Army contracts were used to procure JNN-N in seven spirals, with each spiral equating to approximately one division's worth of equipment. Supplemental funding totaling \$763.6 million for fiscal years 2004 and 2005 was used to purchase the first seven spirals of JNN-N. Additional supplemental funding totaling \$818.7 million for fiscal year 2006 is being used to acquire JNN-N lots 8 through 10.<sup>2</sup>

The Army's approach for acquiring JNN-N was intended to address an urgent need identified during Operation Iraqi Freedom and Operation Enduring Freedom to provide better communications capabilities between soldiers fighting out of sight of one another. DOD's processes for approving formal programs are extensive and have not been conducive to rapid acquisition.<sup>3</sup> However, these processes exist to ensure that programs are managed and overseen, properly funded, and adequately tested prior to fielding. The Army's decision to acquire the capability through an approach that was outside these processes did not address the legal and policy requirements for managing an acquisition program of this magnitude. In particular, JNN-N procurement did not complete initial operational testing before going beyond low-rate production, as required by law and DOD policies.

The acquisition of JNN-N through extraordinary measures was made necessary, in part, by DOD's decision to acquire a revolutionary WIN-T capability. When the Army opted to pursue large technology advances in networking capabilities to support the future force through WIN-T, rather than pursuing a more incremental approach, it accepted a gap in providing tactical networking capabilities to the warfighter. Moreover, the Army's optimistic acquisition approach for WIN-T created the impression that this capability gap was far smaller than it really was. As the Army pursued an advanced WIN-T capability, its existing communications equipment became increasingly obsolete and the need for near-term improvements became more urgent with the onset of the war in Iraq. If the Army had followed DOD's acquisition policy preferences, which emphasize achieving capabilities in increments based on mature technologies to get capability into the hands of the user more quickly, it might have been able to get needed communications capabilities to the warfighter sooner.

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<sup>2</sup>In keeping with its transition from a division-based to a modular brigade-based force, the Army is now procuring JNN-N in batches of brigade sets. It terms these batches lots, rather than spirals.

<sup>3</sup>The Army explored using special rapid acquisition authority to respond to combat emergencies to formally waive acquisition laws and policies for JNN-N, but the dollar limit for use of this authority—\$100 million per year for the entire Department of Defense—was far too low to accommodate the Army's need for JNN-N. See section 806 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (P.L. 107-314), as amended by section 811 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (P.L. 108-375).

### **3. What lessons do the WIN-T and JNN acquisitions have for DOD's requirements, budgeting, and acquisition processes?**

While JNN-N's acquisition was a pragmatic response to an urgent need, the urgency was brought about, in part, by the Army's decision to use a revolutionary, rather than evolutionary, approach to acquiring WIN-T. This approach appeared less risky at the time because optimistic projections created the impression that the capability gap was narrower than it really was. In hindsight, focusing on meeting the needs of the future force at the expense of providing capabilities to the current force proved detrimental once operations commenced in Iraq. To field capabilities quickly, the Army did not use DOD's formal requirements setting, budgeting, and acquisition processes, and over a billion dollars was spent on JNN-N without it being established as a formal program. This is not a good model for providing needed capabilities. The WIN-T/JNN-N experience has implications beyond these two communications systems. The Army's experience thus far creates opportunities to capture lessons learned and apply them not only to the Army's two programs but also to DOD's larger ongoing efforts to reform its acquisition processes. We recently recommended that the Secretary of Defense examine ways to apply the lessons learned from the Army's experience with the acquisition of WIN-T and JNN-N to ongoing DOD-wide efforts to reform its key decision support processes for setting requirements, allocating resources, and acquiring weapon systems. DOD concurred with this recommendation.

### **4. What challenges are presented by the merging of aspects of the WIN-T and JNN programs?**

The Army ultimately intends to create a tactical communications network that functions as a single tactical backbone. To achieve this, the Army must now reconcile two separate acquisition efforts intended to meet one overarching need. Without a sound strategy for meeting near- and long-term needs for communications and networking capabilities, significant risks remain. Affordability continues to be an overriding concern, particularly as the Army and DOD as a whole struggle to meet the needs of current military operations while making prudent investments in the future in a difficult fiscal environment. We recently recommended that the Secretary of Defense direct the Secretary of the Army to develop a sound strategy for transitioning the Army's tactical communications from JNN-N to WIN-T. Such a strategy needs to ensure that requirements for both of these efforts are clearly defined and well integrated, that the fielding strategy is executable, and that sufficient funding has been committed. DOD concurred with this recommendation and noted that the Office of the Secretary of Defense has directed that an approved JNN-N to WIN-T transition strategy be in place before acquiring additional JNN-N systems.

## **Air Force/NAVY/Marine Corps: Multi-Service F-35 Joint Strike Fighter (JSF)**

### **1. Were JSF technologies mature at the time of the decision to enter System Development and Demonstration?**

JSF entered development without its eight critical technologies being mature. Information from the program office indicates that maturity has progressed. However, seven technologies were not mature at the recent design review and two of the technologies

needed for mission effectiveness are not expected to be fully mature until 3 years after production begins. We reported in October 2001 that failure to mature these critical technologies could result in increases in the production and long-term ownership costs, schedule delays, and compromised performance as problems arise in product development.

**2. Is the program ready for a low-rate initial procurement decision in FY 2007? What risks does the program face at the time of this decision?**

The JSF program is not well positioned to enter production at this time. At the time of the low-rate production decision, only one early prototype will have flown and less than one percent of the flight testing will be complete. In addition, none of the three variants will have a production-representative aircraft built and in flight testing. The program intends to invest \$26 billion in initial production before a fully integrated, production-representative aircraft will fly in 2011—4 years after the production decision. The cost of discovering design problems during production could be significant if testing shows that large, structural components of the aircraft require modifications. Furthermore, the length and scope of the remaining effort make it difficult to accurately estimate cost and completion schedules. The program has about 7 years to complete the remaining activities of the System Development and Demonstration phase, such as developing 22 million lines of software code and completing a 7-year, 12,000-hour flight test program. By investing heavily in procuring JSF aircraft before flight testing proves it will perform as expected, DOD has significantly increased its risk of adding more cost and delaying the delivery of critical capabilities to the warfighter.

**3. What criteria must the program meet to demonstrate readiness for low-rate production?**

Key indicators of a program's readiness for entering production and making significant investments in tooling, facilities, and materials include demonstrating that (1) the aircraft's flying qualities function within the parameters of the flight envelope, (2) the aircraft design is reliable, or (3) a fully integrated and capable aircraft system can perform as intended. In addition to a stable design, production processes must be mature. This point is achieved when the program can manufacture the aircraft within cost, schedule, and quality targets. Because the program will lack key design and testing knowledge, DOD plans to use cost reimbursement contracts for early production aircraft. This type of contract places significantly greater cost risk on DOD and the taxpayer. Confidence that investment decisions will deliver expected capability within the cost and schedule goals is likely to increase when flight testing proves the JSF will work as expected.

**4. When will the first production-representative, fully integrated prototype aircraft be demonstrated? How many production aircraft will be on contract by that time?**

Under the current schedule, the first production representative, fully integrated aircraft will not begin flight testing until the 2011 timeframe. This occurs 4 years after production has begun. At that time, DOD will have committed to buy about 190 aircraft costing \$26 billion. By the time testing is planned to be completed, in 2013, DOD will have procured more than double that amount—424 aircraft—at an estimated cost of about \$49 billion.

**5. What are the cost implications if that prototype indicates the need for design changes at that stage of the program?**

The costs of discovering design changes could be significant if testing shows that large, structural components of the aircraft require modifications or mission systems require additional development. For example, problems discovered late in the development of the F-22A increased a 4-year flight test program to about 8 years and affected the program's ability to conduct operational testing and move into production. In the JSF program, design changes needed in one variant could also ripple through the other two variants, reducing efficiencies necessary to lower production costs with common parts and manufacturing processes for the three variants. Some industry officials have indicated that the cost of design changes such as these could be 10 to 1,000 times greater, depending on how far the product has progressed into production.

**6. Under a cost-reimbursable production contract, will the government be responsible for assuming the risk and cost of any needed design changes?**

Cost reimbursement contracts provide for payment of allowable incurred costs, to the extent prescribed by the contract. These contracts are generally used when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed price contract. Under a cost reimbursement contract, the government assumes most of the risks of performance—because it agrees to pay the contractor its allowable incurred costs to the extent prescribed in the contract.

**Air Force: F-22 Aircraft**

**1. What fundamental causes led to the F-22's cost, schedule, and performance problems?**

We have reported in the past on the inefficiencies of the F-22 acquisition program that led to numerous schedule delays and cost increases. This program provides an excellent example of what can happen when a major acquisition program is not guided by the principles of evolutionary, knowledge-based acquisition. The F-22 program failed to match requirements with resources and make early trade-offs and took on a number of new and unproven technologies. As a result, the program failed to capture the appropriate technology, design, and manufacturing knowledge of the F-22 aircraft at the right times during the development process. This created a challenging and risky acquisition environment that ultimately delayed by about 10 years to the warfighter the capabilities expected from this new aircraft. It additionally led to rising development costs, affordability issues, and changing requirements over the 19 years in development.

## **2. Has the F-22 followed DOD policy and best practices?**

No, the F-22 did not follow a best practices approach to its development and procurement. As to whether the F-22 followed DOD policy, we have not specifically assessed the F-22 program's compliance with DOD policy. However, we reported in 2003 ([GAO-04-53](#)) and 2006 ([GAO-06-368](#)) that DOD policy includes a good framework for weapons system development and acquisition, but it does not include sufficient controls to ensure key elements of the policy are implemented in each phase of a weapons system program. As a result, our 2006 report found that weapons system development programs continue to experience cost and schedule growth.

## **3. What concerns do you have over the multiyear procurement proposal for buying more F-22s?**

In testimony earlier this year before the Airland Subcommittee of the Senate Armed Services Committee, we expressed a number of concerns about an Air Force proposal for multiyear procurement of the F-22A (*TACTICAL AIRCRAFT: Questions Concerning the F-22's Business Case*, [GAO-06-991T](#), July 25, 2006). These concerns related to the savings expected to be realized, the use of incremental funding, and the cost risk that could arise if quantities to be ordered continued to decline.. Although Congress subsequently authorized multiyear procurement of the F-22A, it listed a number of requirements the Air Force would have to address related to the concerns we had expressed. In addition, the Congress expressly prohibited the use of incremental funding.

### **Questions from Representative Kaptur:**

In addition to the questions listed above, the Subcommittee also submitted to GAO and DOD a list of eleven supplemental questions for the record from Representative Marcy Kaptur, some of which deal with the use of contractors in Iraq. These questions and others touch on an emerging issue of critical importance, that is, the increasing role that contractors play in conducting the business of government. We appreciate and share the concern underlying the questions.

Although DOD is in a better position than GAO to provide the information that would be needed to respond to each of the eleven questions, we have issued reports regarding the use of private security contractors in Iraq and DOD's use of logistic support contractors, which we believe are relevant to the issues raised by Representative Kaptur. The reports are:

*REBUILDING IRAQ: Actions Needed to Improve Use of Private Security Providers*,  
[GAO-05-737](#), July 2005.

*MILITARY OPERATIONS: DOD's Extensive Use of Logistics Support Contracts Requires Strengthened Oversight*, [GAO-04-854](#), July 2004.

We would be pleased to provide copies of these reports upon request. They are also available on our Web site, <http://www.gao.gov>.

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